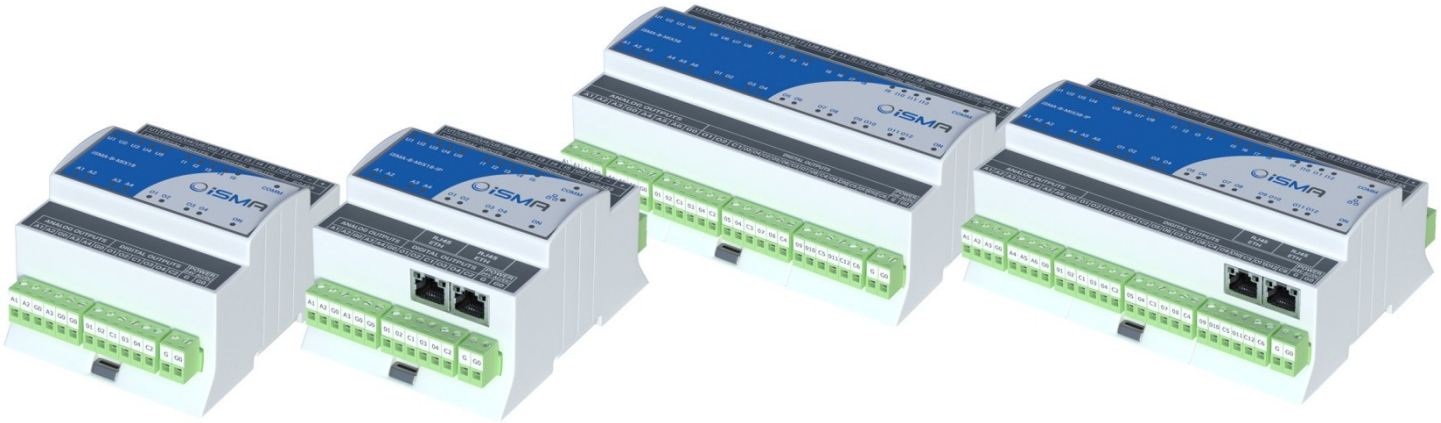
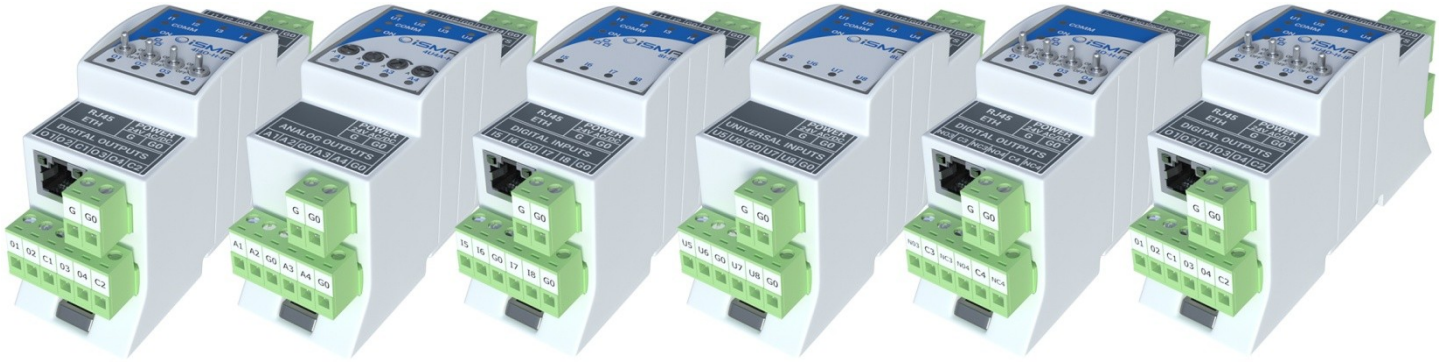
MINI and MIX Series





MINI and MIX Series I/O modules

Modbus

User Manual

GC5 Sp. z o.o.
Poland, Warsaw
www.gc5.com

1 Introduction 4
1.1 Safety rules. 4
1.2 Technical specifications 5
1.3 Summary table for all modules 7
1.4 Dimension 8
1.5 Power supply connection 9
1.5.1 DC power connection 9
1.5.2 AC power connection 9
1.6 Connecting the communication bus (RS485) 9
1.7 LED Indicators 10
1.8 Grounding and shielding RS485 11
1.9 RS 485 network termination 11
1.10 Setting Module Address on Modbus Network 11
1.11 Baud rate selection 12
1.12 Protocol selection 12
1.13 Restoring the default settings 12
1.14 Default Settings 13
2 Configuration registers 14
2.1 Firmware version and module type (30001) 14
2.2 Module address (30002) 14
2.3 Baud rate and protocol (30003) 15
2.4 Counter of received messages (30004) 15
2.5 Counter of error messages (30006) 15
2.6 Counter of sent messages (30008) 15
2.7 Up time (30012) 15
2.8 Device actions (40001) 15
2.9 Baud rate (40136) 16
2.10 Stop bits (40137) 16
2.11 Data bits (40138) 16
2.12 Parity bit (40139) 17
2.13 Response delay time (40140) 17
2.14 Watchdog time (40141) 17
3 Local I/O 18
3.1 Universal Inputs 18
3.1.1 Connection of universal input to measure voltage 0 – 10V 18
3.1.2 Connection of universal input to measure current 0 – 20mA 18
3.1.3 Connection of universal input to measure temperature 18
3.1.4 Connection of universal input as a digital input (Dry Contact) 19
3.1.5 Status of universal inputs working as digital inputs (30017) 19
3.1.6 Universal input measure voltage (30071, 30073, 30075, 30077, 30079, 30087, 30089, 30091) 19
3.1.7 Universal input measure temperature (30072, 30074, 30076, 30078, 30080, 30095, 30097, 30099) 19
3.1.8 Universal input measure resistance 1 - 8 (30103, 30104 – 30117, 30118) 19
3.1.9 Universal input configuration 1 - 8 (40151 – 40158) 20
3.1.10 Filter time constant of the universal input 1 - 8 (40159 – 40166) 20
3.1.11 Resolution of the universal inputs (40167) 21
3.2 Digital Inputs 22
3.2.1 Connection of digital input (Dry Contact) 22
3.2.2 State of digital inputs (30016) 22
3.2.3 Counter 1 – 8 (40023, 40024 – 40037, 40038) 22
3.2.4 Resetting counters (40022) 23
3.3 Analog Outputs 24
3.3.1 Connection of analog output 0 – 10V 24
3.3.2 Connecting relay to analog output 24
3.3.3 Connection an actuator to analog output 24
3.3.4 State of analog outputs working as digital outputs (40019) 25
3.3.5 Value of the analog outputs 1 – 6 (40121 – 40126) 25
3.3.6 Default state of the analog outputs (digital) (40144) 25
3.3.7 Default state of the analog output 1 – 6 (40145 – 40150) 25
3.3.8 Configuration mode of analog output 1 – 6 (40168 – 40173) 26
3.3.9 Hand control status of analog outputs (30015) 26
3.4 Digital Outputs (relays) 27
3.4.1 Connecting the solenoid valve to the digital output 27
3.4.2 Connecting a resistive load to the digital output 27
3.4.3 State of digital outputs (40018) 28
3.4.4 Default state of digital outputs (40143) 28
3.4.5 Hand control status of digital outputs (30015) 29

3.5 Light application modes for 4I4O-H and 4I4O-H-IP 30
3.5.1 Registers for light application modes 30
3.5.2 Ordinary IO 30
3.5.3 Monostabile Relay 30
3.5.4 Bistabile Relay 30
3.5.5 Time Relay 31
3.5.6 Command register (40020) 31
4 WEB Configuration- only IP version 32
4.1 Web server access 32
4.2 Device page 32
4.3 Local I/O status and configuration 33
4.3.1 Universal Inputs 33
4.3.2 Digital Inputs 34
4.3.3 Digital Outputs 34
4.3.4 Analog Outputs 35
4.4 RS485 Configuration 36
4.5 IP Configuration 37
4.6 Device management 38
4.7 Contact 38
5 Modbus TCP/IP modules 39
5.1 Modbus TCP/IP 39
5.2 Module as Modbus TCP/IP Gateway to RS485 39
6 List of all Modbus Registers 41
7 List of supported temperature sensors 49

1 Introduction

1.1 Safety rules.

- Note incorrect wiring of this product can damage it and lead to other hazards. Make sure the product has been correctly wired before turning the power ON.
- Before wiring, or removing / mounting the product, be sure to turn the power OFF. Failure to do so might cause electric shock.
- Do not touch electrically charged parts such as the power terminals. Doing so might cause electric shock.
- Do not disassemble the product. Doing so might cause electric shock or faulty operation.
- Use the product within the operating ranges recommended in the specification (temperature, humidity, voltage, shock, mounting direction, atmosphere etc.). Failure to do so might cause fire or faulty operation
- Firmly tighten the wires to the terminal. Insufficient tightening of the wires to the terminal might cause fire.

1.2 Technical specifications

Power supply	Voltage	24V AC/DC ± 20%	
	Power consumption		
	Module type	@ 24VDC	@ 24VAC
	8I	0.4W	0.6VA
	8I-IP	1.4W	2.1VA
	8U	0.5W	0.8VA
	8U-IP	1.5W	2.3VA
	4I4O-H	1.2W	1.8VA
	4I4O-H-IP	2.2W	3.3VA
	4U4O-H	1.2W	1.8VA
	4U4O-H-IP	2.2W	3.3VA
	4U4A-H	2.2W	3.3VA
	4U4A-H-IP	3.2W	4.8VA
	4O-H	1.6W	2.4VA
	4O-H-IP	2.6W	3.9VA
	MIX18	3W	4.5VA
	MIX18-IP	4.4W	6.6VA
	MIX38	5W	7.5VA
	MIX38-IP	7.4W	11.1VA
Universal Inputs	Temperature input	Measurement with attached RTDs accuracy ±0,1˚C For sensor Pt1000 and Ni1000 use 16bit resolution	
	Voltage input	Voltage measurement from 0 to 10V Input impedance 100kΩ Measurement accuracy ±0,1% Measurement resolution 3mV@12bit and 1mV@16bit	
	Resistive input	Measurement of resistance from 0 to 1000kΩ Measurement resolution for 20kΩ load 20Ω@12bit and 1Ω@16bit	
	Resistance measurement method	The voltage divider	
	Dry contact input	Output current ~1mA	
	Measurement resolution	12 bits (default) or 16 bits	
	Processing time	10ms/channel at 12 bits 140ms/ channel at 16 bits	
Digital Inputs	Type	Dry contact	
	Max input frequency	100Hz	
Analog Outputs	Voltage range	0 to 10V	
	Max. load current	20mA	

	Resolution	12 bits
	Accuracy	±0.5%
Digital Outputs (relays)	Resistive load	3A @ 230VAC or 3A @ 30VDC 8A @ 230VAC or 8A @ 30VDC- **only 4O-H and 4O-H-IP**
	Inductive load	75VA @ 230VAC or 30W @ 30VDC 360VA@ 230VAC or 90W @ 30VDC- **only 4O-H and 4O-H-IP**
RS485 Interface	RS485	Up to 128 devices
	Communication protocols	Modbus RTU, Modbus ASCII or BACnet set by switch
	Baud rate	From 2400 to 115200 set by switch
	Address	0 to 99 set by switch
Ethernet	MIX18-IP, MIX38-IP	
	2x Fast Ethernet	Switch mode
	Baud rate	10/100 Mb/s
	8I-IP, 8U-IP, 4I4O-H-IP, 4u4O-H-IP, 4U4A-H-IP, 4O-H-IP	
	1x Fast Ethernet	
	Baud rate	10/100 Mb/s
USB	USB	Mini USB 2.0
Ingress protection	IP	IP40
Temperature	Storage	– 40˚C to +85˚C
	Operating	– 10˚C to +50˚C
Humidity	Relative	5 to 95%
Connectors	Type	Removable
	Maximum cable size	2.5 mm^2
Dimension	MIX18, MIX18-IP	
	Width	110 mm
	Length	88 mm
	Height	62 mm
	MIX38, MIX38-IP	
	Width	110 mm
	Length	160 mm
	Height	62 mm
	MINI Series	
	Width	110 mm
	Length	37 mm
	Height	62 mm

Table 1 Technical specification

1.3 Summary table for all modules

Module type	UI	DI	AO	DO	Modbus RS485	Modbus TCP/IP	Bacnet MSTP	Bacnet IP
4I4O-H		4		4	✓		✓	
4I4O-H-IP		4		4	✓	✓		✓
4O-H				4 (NC/NO-8A)	✓		✓	
4O-H-IP				4 (NC/NO-8A)	✓	✓		✓
4U4A-H	4		4		✓		✓	
4U4A-H-IP	4		4		✓	✓		✓
4U4O-H	4			4	✓		✓	
4U4O-H-IP	4			4	✓	✓		✓
8I		8			✓		✓	
8I-IP		8			✓	✓		✓
8U	8				✓		✓	
8U-IP	8				✓	✓		✓
MIX18	5	5	4	4	✓		✓	
MIX18-IP	5	5	4	4	✓	✓		✓
MIX38	8	12	6	12	✓		✓	
MIX38-IP	8	12	6	12	✓	✓		✓
					RTU ASCII	Modbus Gateway IP/RS485	Master Slave	

Table 2 Summary table for all modules

1.4 Dimension

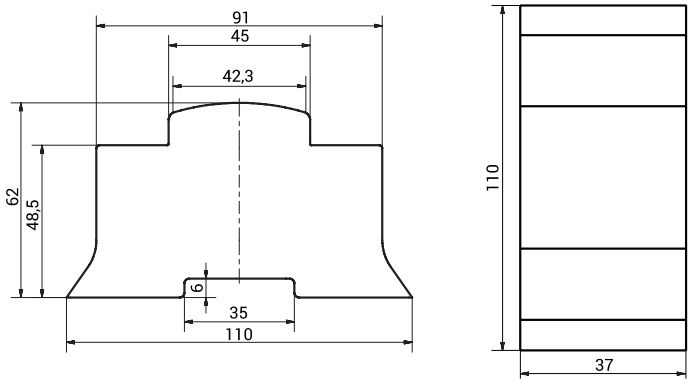


Figure 1 MINI series dimension

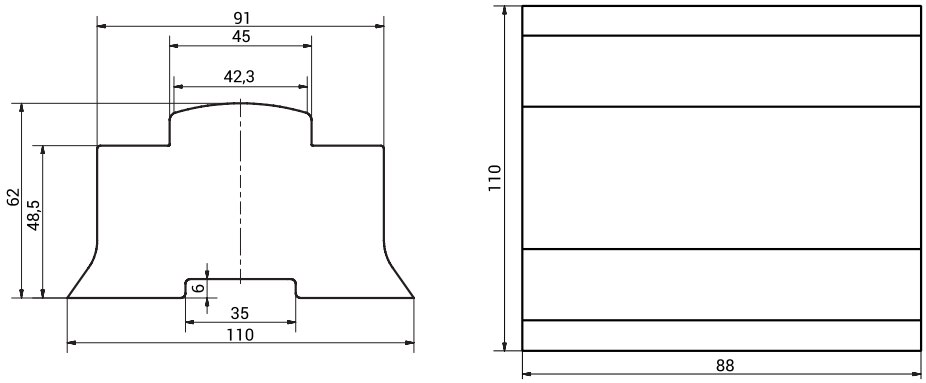


Figure 2 MIX18 and MIX18-IP dimension

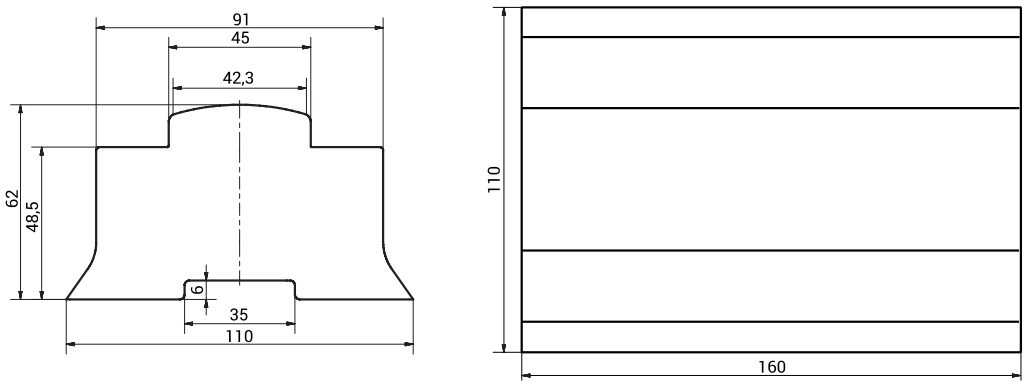


Figure 3 MIX38 and MIX38-IP dimension

1.5 Power supply connection

1.5.1 DC power connection

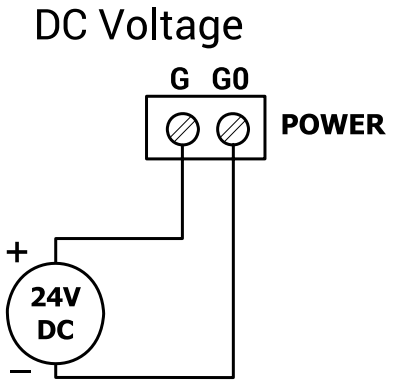


Figure 4 DC power supply connection

1.5.2 AC power connection

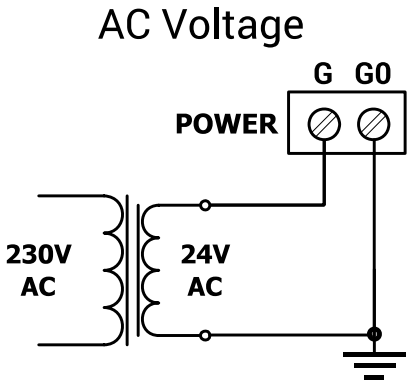


Figure 5 AC power supply connection

1.6 Connecting the communication bus (RS485)

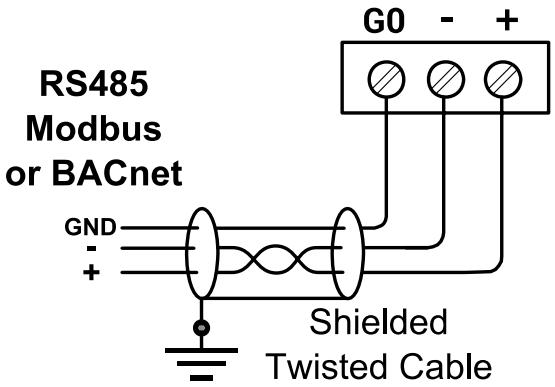


Figure 6 RS485 connection

1.7 LED Indicators

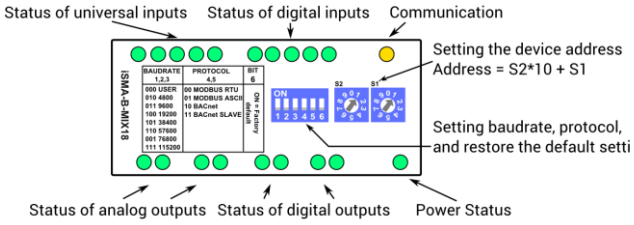


Figure 7 Top panel MIX18

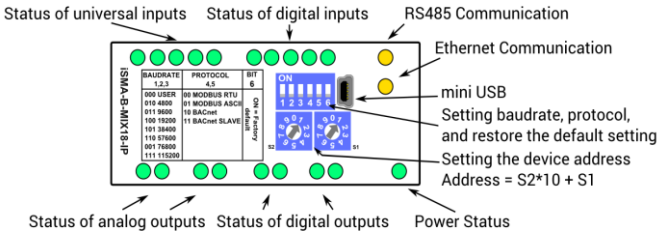


Figure 8 Top panel MIX18-IP

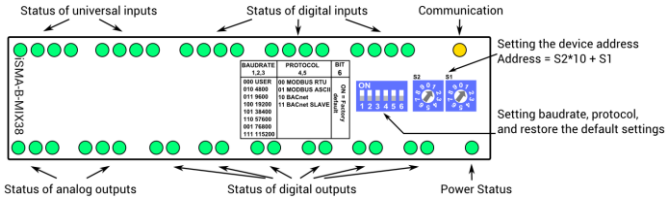


Figure 9 Top panel MIX38

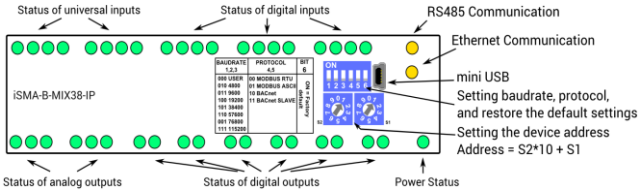


Figure 10 Top panel MIX38-IP

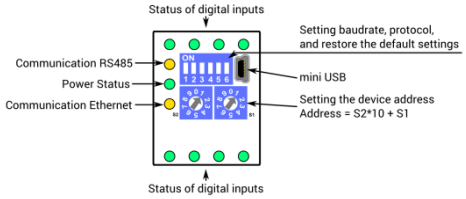


Figure 11 Top panel 8I and 8I-IP

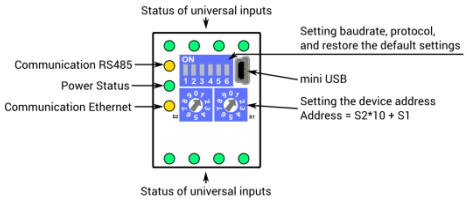


Figure 12 Top panel 8U and 8U-IP

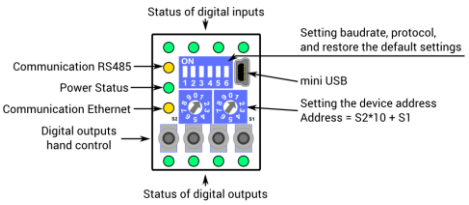


Figure 13 Top panel 4I4O-H and 4I4O-H-IP

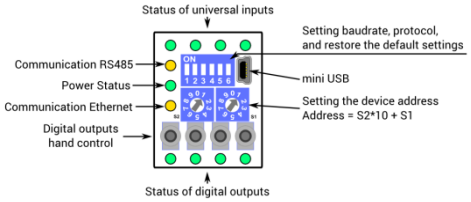


Figure 14 Top panel 4U4O-H and 4U4O-H-IP

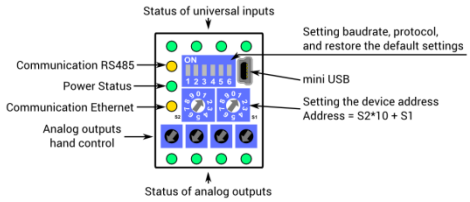


Figure 15 Top panel 4U4A-H and 4U4A-H-IP

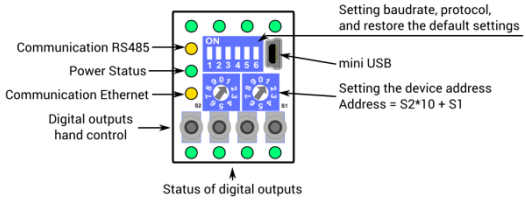


Figure 16 Top panel 4O-H and 4O-H-IP

- The power LED is ON (green) when the module is running properly.
- Communication LED is ON (orange) for 20 ms after sending each message. If the module receives / sends a lot of messages LED can be lit continuously.
- LEDs indicate the status of the universal inputs are lit when resistance connected to the input is less than 1kΩ (Dry Contact input is active). Caution! The LED also lights up when voltage connected to the input has a very low potential.
- LEDs indicate the status of the digital inputs are lit when the input is active.
- LEDs indicate the status of the analog outputs are lit when output voltage or PWM factor is different from 0.
- LEDs indicate the status of the digital outputs are lit when output is enabled.

1.8 Grounding and shielding RS485

In most cases, IO modules will be installed in an enclosure along with other devices which generate electromagnetic radiation. Examples of these devices are relays, contactors, transformers, motor invertors etc. This electromagnetic radiation can induce electrical noise into both power and signal lines, as well as direct radiation into the module causing negative effects on the system. Appropriate grounding, shielding and other protective steps should be taken at the installation stage to prevent these effects. These protective steps include control cabinet grounding, cable shield grounding, protective elements for electromagnetic switching devices, correct wiring as well as consideration of cable types and their cross sections.

1.9 RS 485 network termination

Transmission line effects often present a problem on data communication networks. These problems include reflections and signal attenuation.

To eliminate the presence of reflections from the end of the cable, the cable must be terminated at both ends with a resistor across the line equal to its characteristic impedance. Both ends must be terminated since the direction of propagation is bidirectional. In the case of an RS485 twisted pair cable this termination is typically 120 Ω.

1.10 Setting Module Address on Modbus Network

To determine the address on the Modbus network, module provides two rotary switches S1 and S2 located on the top panel of the device.

It is possible to set the device address from 0 to 99.

The formula for setting the address:

$$\text{Address} = S2 \cdot 10 + S1$$

Where S1 and S2 are values of switches.

Example:

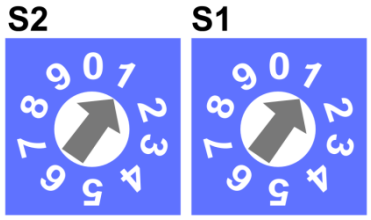


Figure 17 Sample of setting address

Switches set as in figure above will set the module address to 11.

1.11 Baud rate selection

Transmission baud rate is determined by S3 switch (sections 1, 2 and 3) in accordance with the following table:

1	2	3	Baud rate
OFF (0)	OFF (0)	OFF (0)	Defined by the user in the registry
OFF (0)	OFF (0)	ON (1)	76800
OFF (0)	ON (1)	OFF (0)	4800
OFF (0)	ON (1)	ON (1)	9600
ON (1)	OFF (0)	OFF (0)	19200
ON (1)	OFF (0)	ON (1)	38400
ON (1)	ON (1)	OFF (0)	57600
ON (1)	ON (1)	ON (1)	115200 (factory set)

Table 3 Baud rate selection

1.12 Protocol selection

Protocol selection is done by sections 4 and 5 of the S3 switch according to table:

4	5	Protocol
OFF (0)	OFF (0)	Modbus RTU
OFF (0)	ON (1)	Modbus ASCII
ON (1)	OFF (0)	BACnet Master
ON (1)	ON (1)	BACnet Slave

Table 4 Protocol selection

1.13 Restoring the default settings

To restore the default configuration of all registers, follow the steps below:

1. Turn off power supply
2. Set section 6 of S3 switch to ON
3. Turn on power supply, power LED blinking
4. Switch section 6 of S3 switch to OFF to restore the default settings. To cancel the reset, turn off the power and switch section 6 of S3 switch to the OFF position.

1.14 Default Settings

Out of the box device as well as after restoring default values procedure, has got the following default registers values:

Register Name	Default Value
COUNTER 1 – 5	0
BAUD RATE	76800 (76800 bps)
STOP BITS	1
DATA BITS	8
PARITY BITS	0
RESPONSE DELAY	0
WATCHDOG TIME	0 (disabled)
STATE OF THE DIGITAL OUTPUTS AFTER START	0
STATE OF THE ANALOG OUTPUTS (DIGITAL) AFTER START	0
STATE OF THE ANALOG OUTPUTS (1 - 4) AFTER START	0
UNIVERSAL INPUT CONFIGURATION 1 – 5	1
INPUT FILTER TIME CONSTANT	2
UNIVERSAL INPUT RESOLUTION	0
ANALOG OUTPUT CONFIGURATION	0
Only for modules with IP	
Properties	Default Value
Username	admin
Password	1000
IP address	192.168.1.123
Mask	255.255.255.0
Gateway	192.168.1.1
Http port	80
Modbus TCP port	502
Modbus TCP connection timeout	60 s
Modbus RS485 Timeout	500 ms
BACnet UDP port	0xBAC0 (47808)

Table 5 Default values

2 Configuration registers

Warning!: Changing the parameters configuring transmission (except for registers which value is read from the switch) will only take effect after restarting the unit.

2.1 Firmware version and module type (30001)

In this register are encoded type and firmware version of module.

Low byte contains information about the type of module in accordance with table:

Value	Type
81_{10} (0x51_{16})	8I
91_{10} (0x$5B_{16}$)	8I-IP
84_{10} (0x54_{16})	8U
94_{10} (0x$5E_{16}$)	8U-IP
83_{10} (0x53_{16})	4I4O-H
93_{10} (0x$5D_{16}$)	4I4O-H-IP
85_{10} (0x55_{16})	4U4O-H
95_{10} (0x$5F_{16}$)	4U4O-H-IP
86_{10} (0x56_{16})	4U4A-H
96_{10} (0x60_{16})	4U4A-H-IP
82_{10} (0x52_{16})	4O-H
92_{10} (0x$5C_{16}$)	4O-H-IP
50_{10} (0x32_{16})	MIX18
51_{10} (0x33_{16})	MIX38
52_{10} (0x34_{16})	MIX18-IP
53_{10} (0x35_{16})	MIX38-IP

Table 6 Firmware version and module type

High byte contains the module firmware version multiplied by 10

An example:

In register 30001 is number 12810_{10} = 0x$320A_{16}$. This means that it is a module MIX18 (0x32) with firmware in version 1.0 (0x$0A_{16}$ = 10_{10})

2.2 Module address (30002)

This register contains information about the address of the Modbus module. This address is set using switches S1 and S2 (see section Setting Module Address on Modbus Network).

2.3 Baud rate and protocol (30003)

The register contains information about the baud rate and type of protocol in accordance with the table below. This register reflects the state of the switch S3.

Baud rate				Protocol		
Bit 0	Bit 1	Bit 2	Baud rate	Bit 3	Bit 4	Protocol
0	0	0	User defined	0	0	Modbus RTU
0	0	1	2400	0	1	Modbus ASCII
0	1	0	4800	1	0	BACnet Master
0	1	1	9600	1	1	BACnet Slave
1	0	0	19200			
1	0	1	38400			
1	1	0	57600			
1	1	1	115200			

Table 7 Baud rate and protocol

2.4 Counter of received messages (30004)

32-bit register with the number of valid Modbus received messages by the module from last powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

2.5 Counter of error messages (30006)

32-bit register with the number of error Modbus received messages by the module from last powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

2.6 Counter of sent messages (30008)

32-bit register with the number of Modbus sent messages by the module from last powered up. The value is reset after power cycle or after changing transmission parameters (speed, stop bits, parity, etc.).

2.7 Up time (30012)

This 16-bits register contains information in seconds about „Up time".

2.8 Device actions (40001)

Setting register 40001 according to the table below will enable 1 of 3 available actions: reset module, reload settings and set to default.

Value	Action
511	Reset
767	Reload settings
1023	Set to default

Table 8 Device actions

2.9 Baud rate (40136)

When sections 1,2 and 3 of S3 switch are in off position, baud rate is determined in accordance with this register. Baud rate is determined by the following formula:

Baud rate = Register value • 10

2.10 Stop bits (40137)

Number of stop bits is determined on the basis of this register in accordance with the following table:

Value	No of stop bits
1 (default)	1
2	2

Table 9 Stop bits

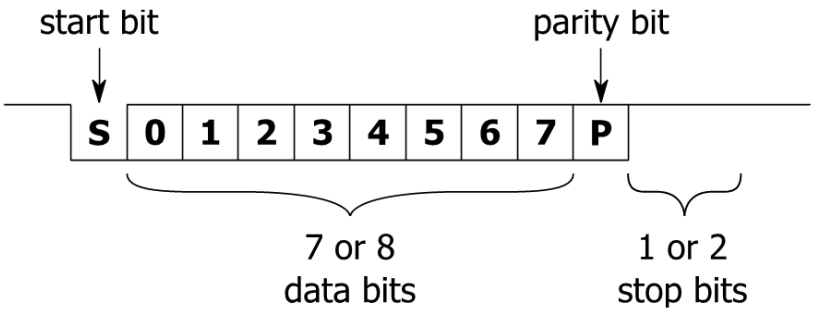


Figure 18 Modbus message frame

2.11 Data bits (40138)

Number of data bits transmitted in a single byte is determined according to the following table:

Value	No of data bits
7	7
8 (default)	8

Table 10 Data bits

2.12 Parity bit (40139)

Each byte of data being transferred may have additional protection as a parity bit added before stop bit (bits).

The method of calculating parity bit determines the table below:

Register value	Type of parity bit
0 (default)	none
1	Odd (number of all ones in a byte is odd)
2	Even (number of all ones in a byte is even)
3	Always 1
4	Always 0

Table 11 Parity bit

2.13 Response delay time (40140)

The value of this 16-bits register determines the number of milliseconds to wait before the unit answers the question. This time is used to extend the interval between question and answer. The default value of 0 means no delay (the answer is sent once during the 3.5 character required by the protocol Modbus RTU).

2.14 Watchdog time (40141)

This 16-bits register specifies the time in seconds to watchdog reset. If module does not receive any valid message within that time, all digital and analog outputs will be set to default status, which are determined by value of Default state of the analog outputs (digital) (40144) and Table 22 State of DO for MIX38 and MIX38-IP

Default state of digital outputs (40143) registers.

This feature is useful if for some reason there is an interruption in data transmission and for security reasons output states must be set to the appropriate state endanger the safety of persons or property.

The default value is 0 seconds which means the watchdog function is disabled.

3 Local I/O

3.1 Universal Inputs

3.1.1 Connection of universal input to measure voltage 0 – 10V

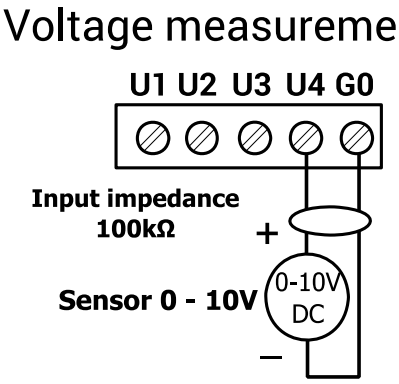


Figure 19 Connection of UI to measure 0-10 VDC for MIX38 and MIX38-IP

3.1.2 Connection of universal input to measure current 0 – 20mA

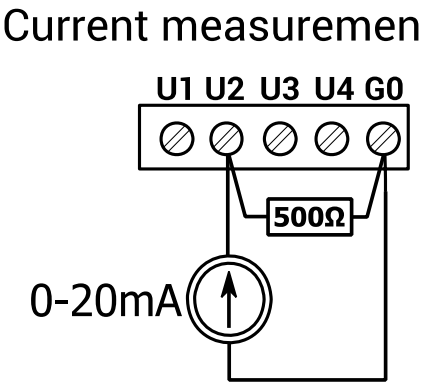


Figure 20 Connection of UI to measure 0-20 mA for MIX38 and MIX38-IP

3.1.3 Connection of universal input to measure temperature

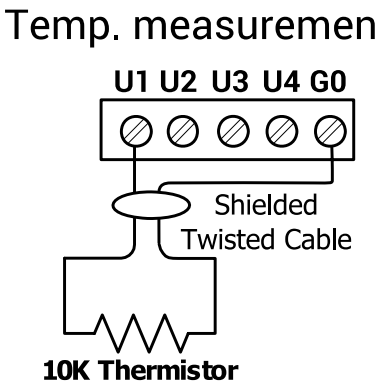


Figure 21 Connection of UI to measure temperature for MIX18 and MIX18-IP

3.1.4 Connection of universal input as a digital input (Dry Contact)

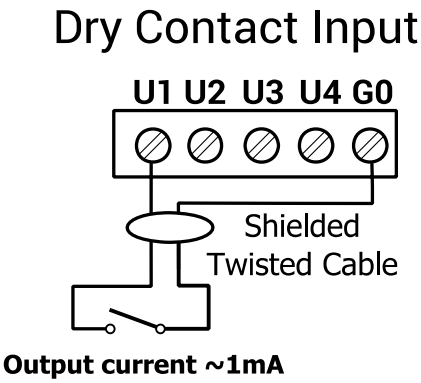


Figure 22 Connection of UI to work as DI for MIX38 and MIX38-IP

3.1.5 Status of universal inputs working as digital inputs (30017)

This 16-bits register contains information about the status of digital inputs (dry contact). Short the input to ground will set the corresponding bit in the register in accordance with the following table:

No of bit in register	No of universal input
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8

Table 12 UI register working as DI for MIX38 and MIX38-IP

3.1.6 Universal input measure voltage (30071, 30073, 30075, 30077, 30079, 30087, 30089, 30091)

In these 16-bits registers are the results of measuring the voltage for each input. The result is expressed in millivolts.

3.1.7 Universal input measure temperature (30072, 30074, 30076, 30078, 30080, 30095, 30097, 30099)

In these 16-bits registers are the results of temperature measurement for each input. The result is expressed in Celsius degrees • 10

3.1.8 Universal input measure resistance 1 - 8 (30103, 30104 – 30117, 30118)

In these 32-bits registers are the results of the resistance measurement for each input. The result is expressed in Ω. In the register with lower number is storage lower part of result and higher register storage higher part of result.

3.1.9 Universal input configuration 1 - 8 (40151 – 40158)

These 16-bits registers are used to configure universal inputs in accordance with the following table:

Register value	Description
0	Off resistance measurement (only measuring the voltage, dry contact off)
1 (default)	The temperature sensor 10K3A1 NTC B=3975K
2	The temperature sensor 10K4A1 NTC B=3695K
3	The temperature sensor 10K NTC B=3435K Carel
4	The temperature sensor 20K6A1 NTC B=4262K
5	The temperature sensor 2,2K3A1 NTC B=3975K
6	The temperature sensor 3K3A1 NTC B=3975K
7	The temperature sensor 30K6A1 NTC B=4262K
8	The temperature sensor SIE1
9	The temperature sensor TAC1
10	The temperature sensor SAT1
16	The temperature sensor Pt1000
17	The temperature sensor Ni1000
+128 (set 7. bit of register)	Off voltage measurement

Table 13 Universal inputs configuration

3.1.10 Filter time constant of the universal input 1 - 8 (40159 – 40166)

These 16-bits registers with a time constant low pass filter. The value is expressed in seconds. Valid values must be between 0 and 60 seconds. The default filter value is 2 seconds. Setting value 0 will disable the filter.

3.1.11 Resolution of the universal inputs (40167)

This register is used to determine the bit resolution for each universal input.

Setting the bit to 0 will set the resolution of converter to 12 bit. Setting the bit to 1 sets the resolution of converter to 16-bit.

Caution! Setting 16-bit resolution increases measurement time of one channel from 10ms to 140ms. Total time taken to measure all the channels increases from 50ms to 700ms.

Each input can be configured separately in accordance with the following table:

No of bit in register	No of universal input
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8

Table 14 Universal inputs resolution for MIX38 and MIX38-IP

3.2 Digital Inputs

3.2.1 Connection of digital input (Dry Contact)

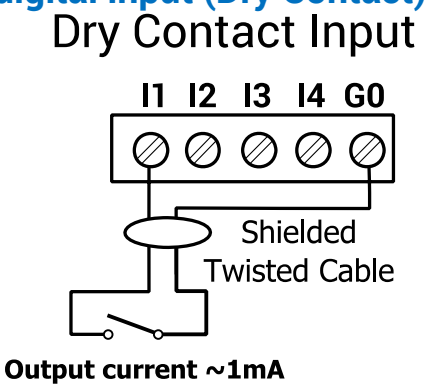


Figure 23 Connection of DI for MIX38 and MIX38-IP

3.2.2 State of digital inputs (30016)

This 16-bits register contains the status of the digital inputs. Short-circuiting the input to GND sets the corresponding bit in the register in accordance with the table:

No of bit in register	No of digital input
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8

Table 15 Status of DI for MIX38 and MIX38-IP

3.2.3 Counter 1 – 8 (40023, 40024 – 40037, 40038)

The modules have 32-bit counters, one for each digital input.

In the register with lower number is stored lower byte of the counter and in the register with higher number is stored higher byte of the counter.

In the case you would like to change the value of the register you can write any value (called preset) for pulse counting registers. In the particular case, you can reset the counter by entering 0. Reset counter is also possible via the registry 40022 (Resetting counters (40022)).

3.2.4 Resetting counters (40022)

Set bit in this 16-bits register cause resets (sets to 0) its corresponding counter in accordance with the following table:

No of bit in register	No of digital input
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8

Table 16 Resetting counters for MIX38 and MIX38-IP

Set bit in register causes continuously reset the counter. Setting the bit to 0 restores normal operation.

3.3 Analog Outputs

3.3.1 Connection of analog output 0 – 10V

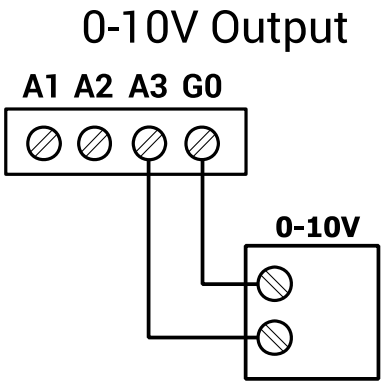


Figure 24 Connection of AO for MIX38 and MIX38-IP

3.3.2 Connecting relay to analog output

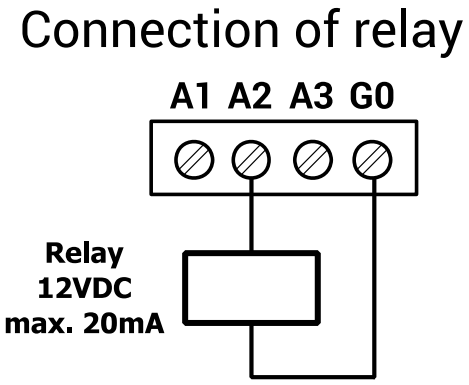


Figure 25 Connection of AO to the relay for MIX38 and MIX38-IP

3.3.3 Connection an actuator to analog output

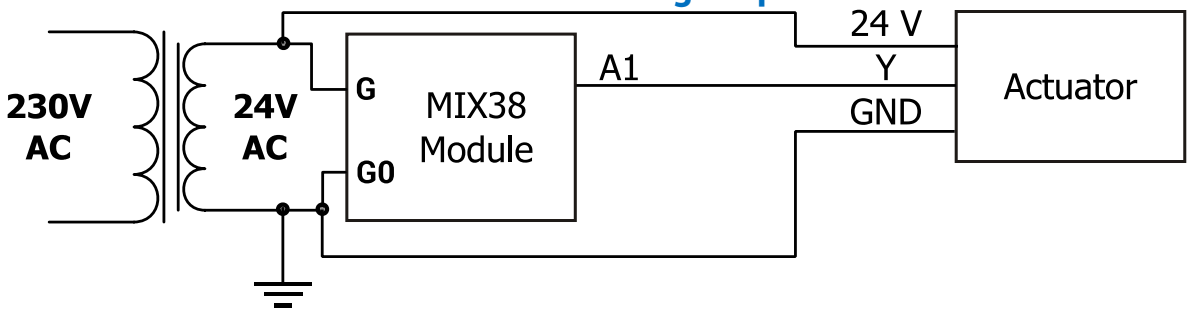


Figure 26 Connection an actuator to AO

3.3.4 State of analog outputs working as digital outputs (40019)

Set bit in this 16-bits register cause set maximum output voltage (10V) on corresponding output and set to 0 corresponding register with analog output value (40121 – 40126).

Bits of register correspond to the following analog outputs.

No of it in register	No of analog output
0	1
1	2
2	3
3	4
4	5
5	6

Table 17 AO working as DO for MIX38 and MIX38-IP

3.3.5 Value of the analog outputs 1 – 6 (40121 – 40126)

In these 16-bits registers are stored value in mV of voltage that appears at the analog output.

3.3.6 Default state of the analog outputs (digital) (40144)

Set bit in this 16-bits register sets the maximum voltage (10V) at the corresponding analog output after power on or watchdog reset.

Bits in register correspond to the following analog outputs:

No of bit in register	No of analog output
0	1
1	2
2	3
3	4
4	5
5	6

Table 18 Default state of AO working as DO for MIX38 and MIX38-IP

3.3.7 Default state of the analog output 1 – 6 (40145 – 40150)

In these 16-bits registers are stored value in mV of voltage that appears at the analog output after power on or watchdog reset.

3.3.8 Configuration mode of analog output 1 – 6 (40168 – 40173)

These 16-bits registers contain information about the mode of the analog outputs according to following table:

Register value	Description
0 (default)	Voltage output 0 – 10V
1	PWM 1Hz
2	PWM 10Hz
3	PWM 100Hz
4	PWM 0.1Hz
5	PWM 0.01Hz

Table 19 AO type settings

3.3.9 Hand control status of analog outputs (30015)

This register is available only for the modules with manual control of analog outputs.

No of bit in register	Description
0,1	Hand status of outputs 1
2,3	Hand status of outputs 2
4,5	Hand status of outputs 3
6,7	Hand status of outputs 4

Table 20 AO Hand control bits

Value of Hand status	Status Description
0	AUTO
1	HAND CONTROL

Table 21 AO Hand control value

The current value of output in the hand mode determines register 30125 to 30128. They contain a percentage value of manual control for outputs from 1 to 4.

3.4 Digital Outputs (relays)

3.4.1 Connecting the solenoid valve to the digital output

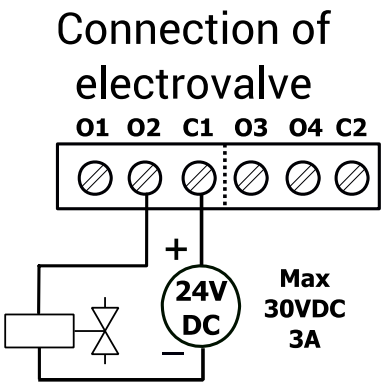


Figure 27 Connection of solenoid valve to DO for MIX38 and MIX38-IP

3.4.2 Connecting a resistive load to the digital output

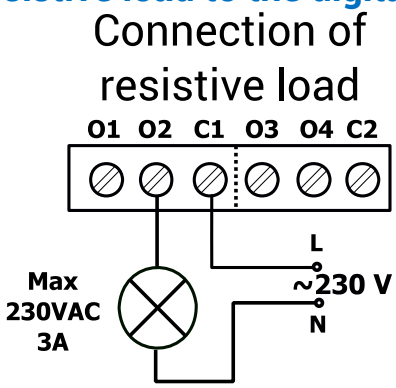


Figure 28Connection of resistive load to DO for MIX38 and MIX38-IP

3.4.3 State of digital outputs (40018)

This 16-bits register contains the state of the digital outputs. Set bit in the register enables the corresponding digital output according to the following table:

No of bit in register	No of digital output
0	1
1	2
2	3
3	4
4	5
5	6

Table 22 State of DO for MIX38 and MIX38-IP

3.4.4 Default state of digital outputs (40143)

This 16-bits register contains the default state of the digital output device after the start or watchdog reset. Register bits correspond to the digital outputs according to the following table:

No of bit in register	No of digital output
0	1
1	2
2	3
3	4
4	5
5	6

Table 23 Default status of DO for MIX38 and MIX38-IP

3.4.5 Hand control status of digital outputs (30015)

This register is available only for the modules with manual control of outputs.

No of bit in register	Description
0,1	Hand status of outputs 1
2,3	Hand status of outputs 2
4,5	Hand status of outputs 3
6,7	Hand status of outputs 4

Table 24 DO Hand control bits

Value of Hand status	Status Description
0	AUTO
2	HAND OUT = 0
3	HAND OUT = 1

Table 25 DO Hand control value

3.5 Light application modes for 4I4O-H and 4I4O-H-IP

3.5.1 Registers for light application modes

The digital inputs in modules type 4I4O-H and 4I4O-H-IP can be set to work in 4 different modes. There are dedicated registers for operation mode (40176, 40180, 40184, 40188) and for time parameters (40177, 40181, 40185, 40189).

Register	Description
40176	DI1 OPERATION MODE
40177	DI1 TIME VALUE
40180	DI2 OPERATION MODE
40181	DI2 TIME VALUE
40184	DI3 OPERATION MODE
40185	DI3 TIME VALUE
40188	DI4 OPERATION MODE
40189	DI4 TIME VALUE

Table 26 List of registers for light application mode

Operating mode can be changed by writing right value in the configuration register. The table below shows the records of the relevant modes.

Value (40176, 40178)	Operating Mode
0	Ordinary IO
1	Monostabile Relay
2	Bistabile Relay
3	Time Relay

Table 27 Light application modes

3.5.2 Ordinary IO

In this mode, module works as a standard IO, inputs and outputs are not related which each other.

3.5.3 Monostabile Relay

In this mode both rising and falling edge on digital input change output state. The output of the module is related with input. Output O1 is related with input DI1, output O2 is related with input DI2 and so on. The action of monostabile relay can by executed remotely by changing the state of bit from false to true in COMMAND register (40020). Outputs can by also overwritten by DIGITAL OUTPUT register (40018), which allows remote control from BMS.

3.5.4 Bistabile Relay

In this mode only rising edge on digitall input change output state. The output of the module is related with input. Output O1 is related with input DI1, output O2 is related with input DI2 and so on. The action of bistabile relay can by executed remotely by changing the state of bit from false to true in COMMAND register (40020). Outputs can by also overwritten by DIGITAL OUTPUT register (40018), which allows remote control from BMS.

3.5.5 Time Relay

In this mode rising edge on special input set output for time defined in time value register. Switch-on time is counted from last rising edge. The output of the module is related with input. Output O1 is related with input DI1, output O2 is related with input DI2 and so on. The action of time relay can by executed remotely by changing the state of bit from false to true in COMMAND register (40020). Outputs can by also overwritten by DIGITAL OUTPUT register (40018)), with allows remote control from BMS.

3.5.6 Command register (40020)

The module have special register COMMAND (40020). The command register is used to remotely execute action (simulate light switch/PIR). The action is executed by changing state of relevant bit (changing from false to true).

No of bit in register (40020)	Command input number
0	1
1	2
2	3
3	4

Table 28 Command register for light application modes

4 WEB Configuration- only IP version

4.1 Web server access

All IP version modules have build in web server, which allows to show module status and to change configuration.

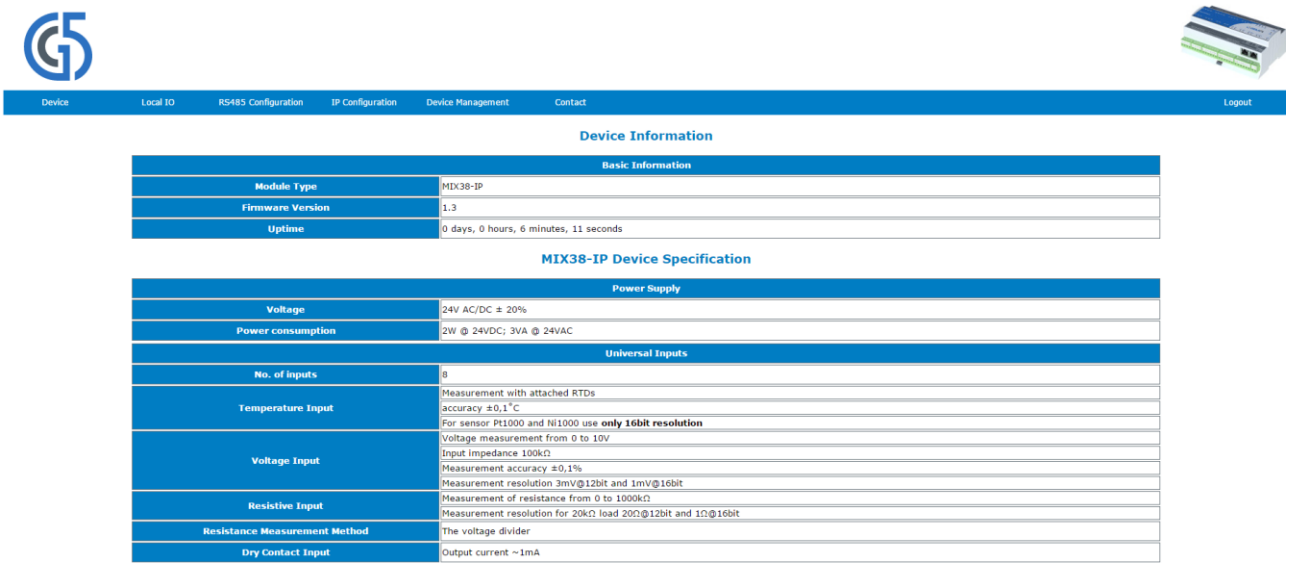
To access web server open browser and entre IP address of the module, default address for new module (default IP address is 192.168.1.123). Please use the following credentials :

Username: admin

Password: 1000 (by default)

4.2 Device page

This page contains information and technical specification of the device. The Basic Information section includes information about module type, firmware version and uptime. In the Device Specification there are information about: Power Supply, Inputs / Outputs parameters, Interfaces and Mechanical.



Device | Local IO | RS485 Configuration | IP Configuration | Device Management | Contact | Logout

Device Information

Basic Information	
Module Type	MIX38-IP
Firmware Version	1.3
Uptime	0 days, 0 hours, 6 minutes, 11 seconds

MIX38-IP Device Specification

Power Supply	
Voltage	24V AC/DC ± 20%
Power consumption	2W @ 24VDC; 3VA @ 24VAC
Universal Inputs	
No. of inputs	8
Temperature Input	Measurement with attached RTDs accuracy ±0,1°C For sensor Pt1000 and Ni1000 use **only 16bit resolution**
Voltage Input	Voltage measurement from 0 to 10V Input impedance 100kΩ Measurement accuracy ±0,1% Measurement resolution 3mV@12bit and 1mV@16bit
Resistive Input	Measurement of resistance from 0 to 1000kΩ Measurement resolution for 20kΩ load 20Ω@12bit and 1Ω@16bit
Resistance Measurement Method	The voltage divider
Dry Contact Input	Output current ~1mA

Figure 29 Device page of MIX38-IP

4.3 Local I/O status and configuration

4.3.1 Universal Inputs

This page allows to enter configuration parameters and show actual value of Universal Inputs. To open this page please navigate to Local IO tab and choose Universal Inputs from submenu.

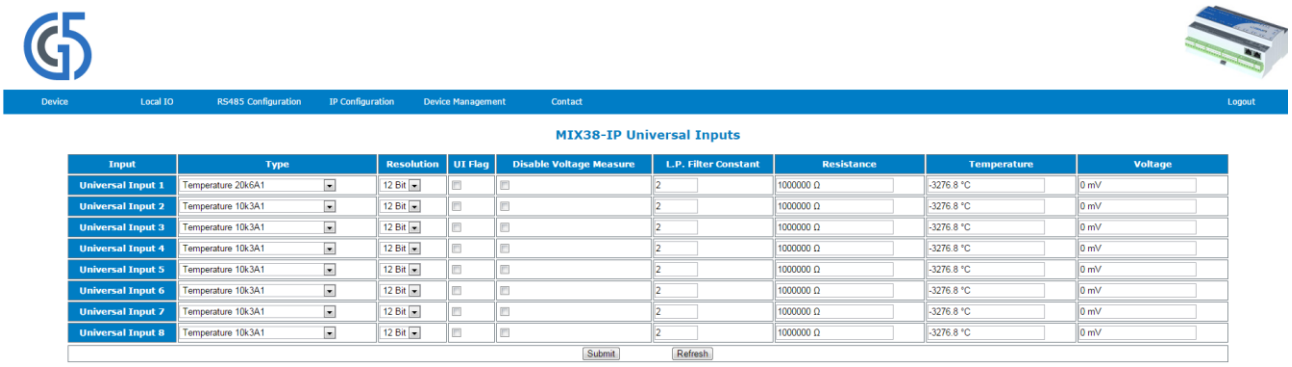


Figure 30 Universal Inputs page of MIX38-IP

Universal Input table has the following fields:

- Sensor type (Read & Write) allows to set different type of sensor as show below:

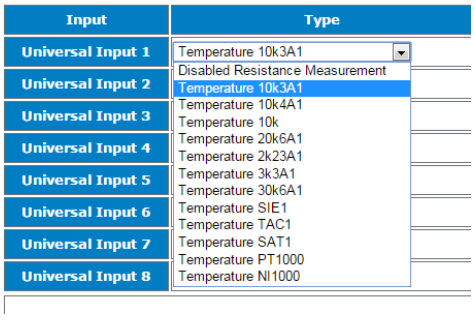


Figure 31 Types of sensors

- Resolution (Read & Write), resolution measurement 12bits / 16bits (for PT1000 and Ni1000 sensors please use 16bits).
- UI Flag (Read Only), status of UI as DI.
- Disable Voltage Measurement (Read & Write), disable voltage measuring for resistance measurement only.
- L.P. Filter Constant (Read & Write),parameter time constant low pass filter in seconds. Valid values must be between 0 and 60 seconds (default 2s). Setting value 0 will disable the filter.
- Resistance (Read Only), in ohms from 0 to 1000k [Ω]
- Temperature (Read Only), in Celsius with an accuracy of 1 decimal [°C]
- Voltage (Read Only) in milivolts [mV].

Warning ! To save changes please use “Submit” button.

4.3.2 Digital Inputs

This page allows to enter configuration parameters and shows actual value of Digital Inputs. To open this page please navigate to Local IO tab and choose Digital Inputs from submenu.

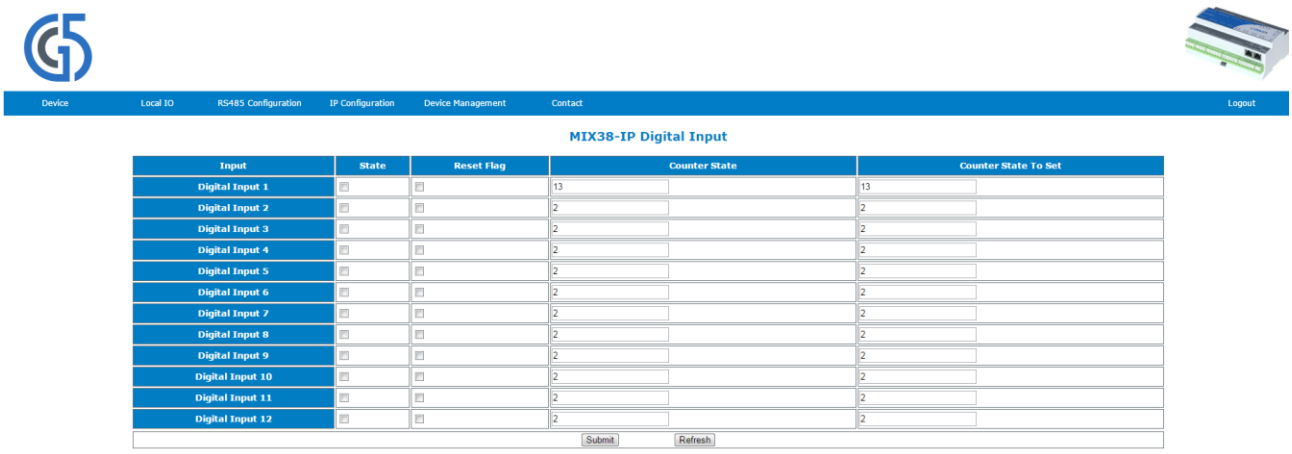


Figure 32 Digital Inputs page of MIX38-IP

Digital Input table has the following fields:

- State (Read Only), actual input state
- Reset Flag (Read & Write), reset of pulses value (leaving reset active will case resetting pulses value),
- Counter State (Read Only), actual value of pulses save in EEPROM
- Counter State To Set (Read & Write), allows to set value of counter

Warning ! To save changes please use “Submit” button.

4.3.3 Digital Outputs

This page allows to enter configuration parameters and show actual value of Digital Outputs. To open this page please navigate to Local IO tab and choose Digital Outputs from submenu.

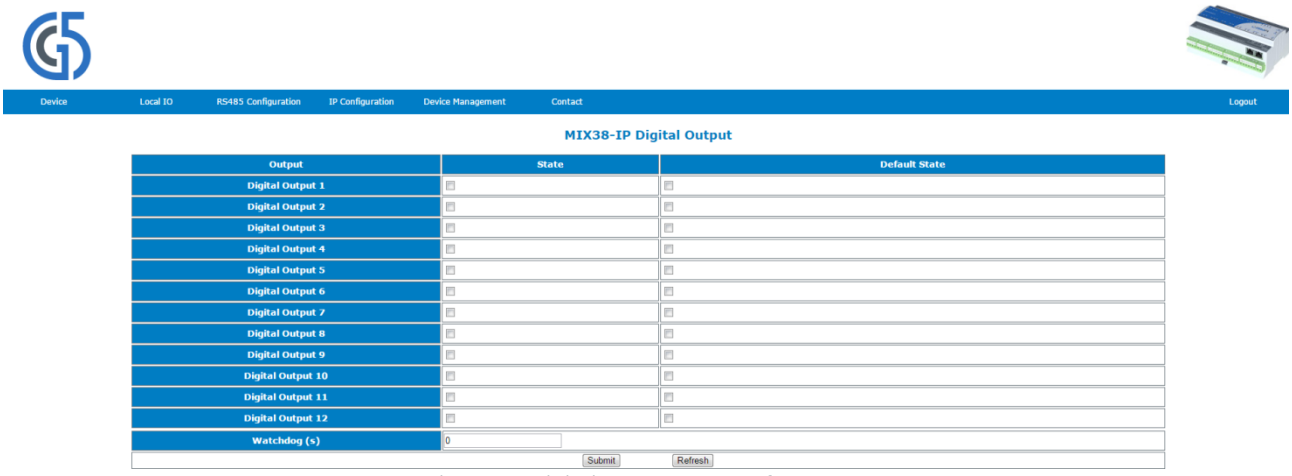


Figure 33 Digital Outputs page of MIX38-IP

Digital Outputs table has the following fields:

- State (Read & Write), actual state of digital output,
- Default State (Read & Write), output state after power up and watchdog.
- Watchdog (Read & Write),device watchdog value in seconds.
-

Warning ! To save changes please use “Submit” button.

4.3.4 Analog Outputs

This page allows to enter configuration parameters and show actual value of Analog Outputs. To open this page please navigate to Local IO tab and choose Analog Outputs from submenu.

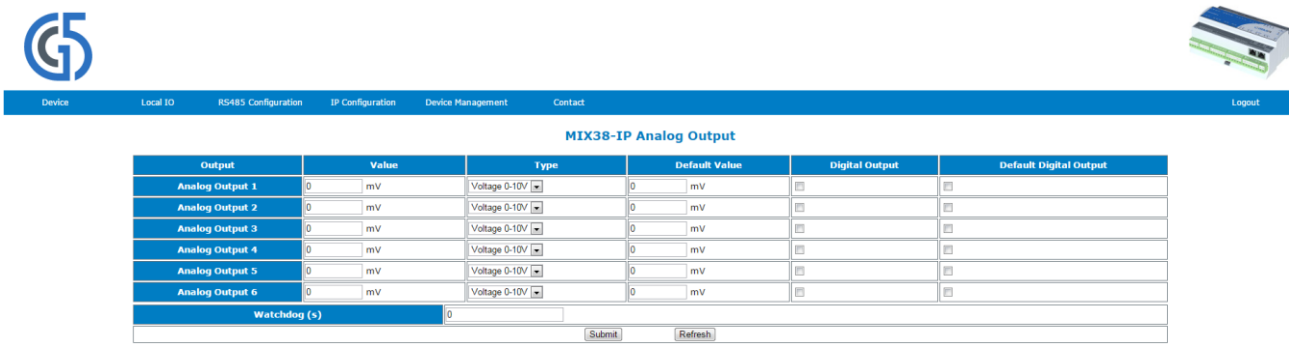


Figure 34 Analog Outputs page of MIX38-IP

Analog Outputs table has the following fields:

- Value (Read & Write), actual value of analog output in milivolts [mV],
- Type (Read & Write), analog output working mode voltage / PWM.
- Default Value (Read & Write). default output value after power up and watchdog.
- Digital Output (Read & Write). output status flag for DO mode.
- Default Digital Output (Read & Write). default output status for DO mode.
- Watchdog (Read & Write), device watchdog value in seconds.
-

Warning ! To save changes please use “Submit” button.

4.4 RS485 Configuration

This page allow to enter configuration parameters and show information of controllers RS485 port.

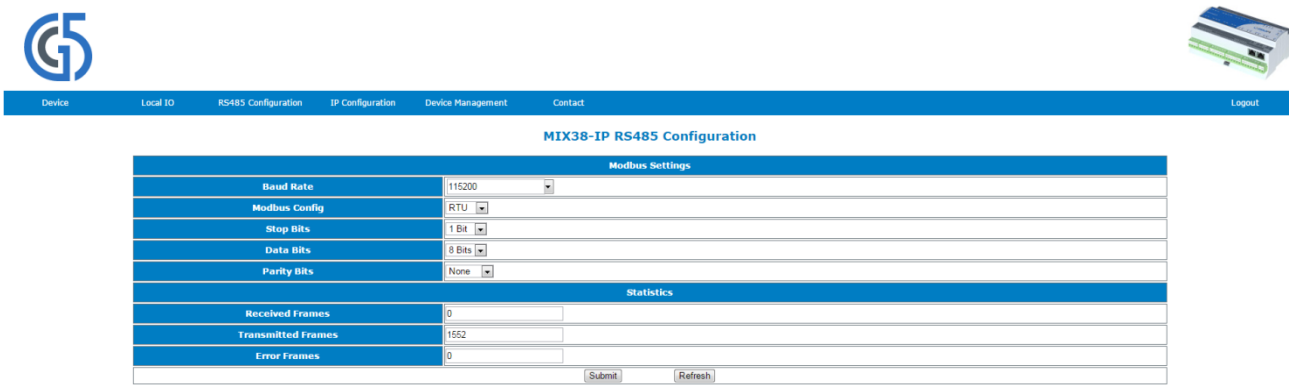


Figure 35 RS485 configuration page

This page allows to set parameters such as:

- Baud rate (Read Only), RS485 baud rate from 2400 up to 115200,
- Modbus Config (Read Only), Modbus Protocol Type- RTU or ASCII,
- Stop Bits (Read & Write), number of stop bits (1 or 2),
- Data Bits (Read & Write), number of data bits transmitted in a single byte (7 or 8)
- Parity Bits (Read & Write), transmission protection as a parity bit added before stop bit (bits).
- Received Frames (Read Only), number of received frames,
- Transmitted Frames (Read Only), number of transmitted frames,
- Error Frames (Read Only), number of error frames,
-

Warning ! To save changes please use “Submit” button.

4.5 IP Configuration

This page allows to change parameters of Ethernet port, Modbus TCP and BACnet IP.

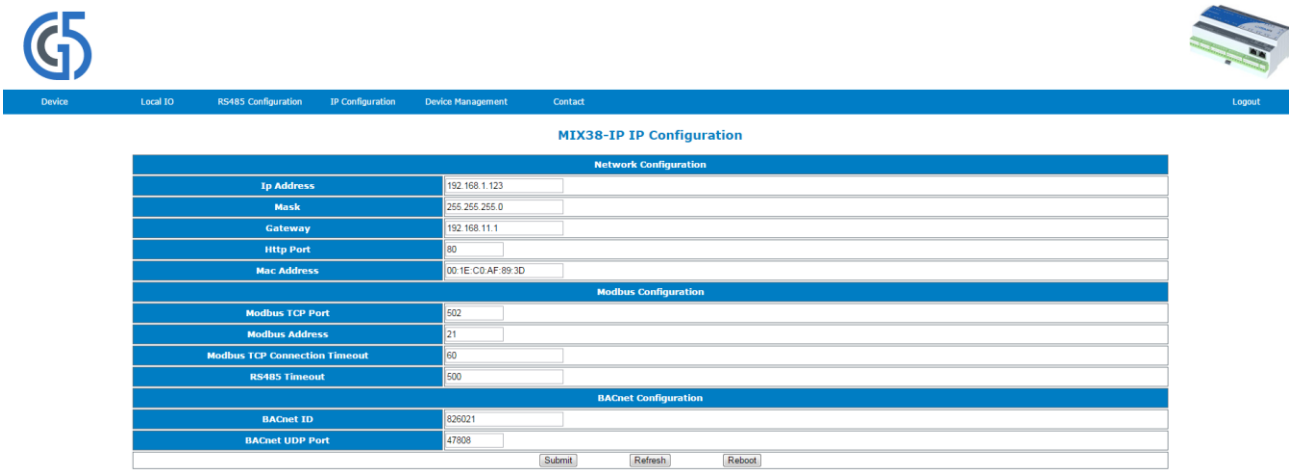


Figure 36 IP configuration page

This page allows to set parameters such as:

- Ip Address (Read & Write), controller Ethernet interface IP address,
- Mask (Read & Write), network mask,
- Gateway (Read & Write), network default gateway,
- Http Port (Read & Write), http port,
- Mac Address (Read Only), Ethernet interface MAC address,
- Modbus Tcp Port (Read & Write), Modbus TCP port number, default 502,
- Modbus Address (Read Only). Modbus device address set by rotary switches,
- Modbus TCP Communication Timeout (Read & Write), timeout for TCP/IP messages,
- RS485 Timeout (Read & Write), timeout for Modbus RTU/ASCII messages,
- BACnet ID (Read & Write),BACnet ID set by rotary switches, this value can be overridden by the user, once overridden by user changing rotary switches will not affect BACnet ID,
- BACnet UDP port (Read & Write),BACnet IP port,
-

Warning ! To save changes please first click “Submit” button and then “Reboot” button

4.6 Device management

This page allows to change password and remote reboot device.

Figure 37 Device management page

Procedure of changing device password:

a) enter current device password in field - Current Device Password,

b) enter new device password in field - New Device Password,

c) enter again new device password in field - Confirm New Device Password,

d) to confirm password change please click “Submit” button,

e) pleas Logout and Login again using new password

Warning ! To reset password to default refer to “Restoring default settings”

4.7 Contact

This page displays information about Manufacture web address and email to technical support.

5 Modbus TCP/IP modules

5.1 Modbus TCP/IP

The device simultaneously supports up to 4 Modbus TCP clients. If the fifth device will want to connect to the module, TCP connection will be rejected. In order to secure the module before filling up the call list, it was introduced a mechanism for monitoring each Modbus TCP connection. There is a parameter called Modbus TCP Communication Timeout (default 60s), If during this time will not come any request from the Modbus TCP client, module will close the connection.

To read internal registers of the module need to generate the correct MODBUS TCP frame with address according to the setting of dipswitch, If the address is different the frame will be sent to the RS485 port.

If module receive an incorrect MODBUS TCP frame, it sends back a frame with error code:

0x01 - if the function code in the query is not supported

0x02 - if the address of the register is invalid

0x03 - If in the query disagrees the amount of data

If the query is correct, device instantly generates answer with the data or acknowledgment of receipt of data, depending on the query.

5.2 Module as Modbus TCP/IP Gateway to RS485

All IP version modules have build in Modbus TCP/IP to RS485 gateway which allows to connects using RS485 an additional I/O modules or 3rd party Modbus devices. In order to ensure proper operation of Modbus Gateway please make sure that all parameters of RS485 (Baud Rate, Stop Bits ect.) of all the devices connected to RS485 (Gateway and an addition I/O modules/devices) are same.

Operation of gateway is based on checking the MODBUS address in the query. If the address is different from the set on the dipswitch, data frame from query is converted to MODBUS RTU/ASCII, and sent to the RS485 port. Then the module waits for an answer from device connected to the RS485, if slave does not respond within the estimated time defined by the RS485 Timeout (default 500ms), an exception response will be given: error code 0x0B. If the slave answered the correct frame, it is converted to Modbus TCP and sent to the master.

All IP version modules have build in Modbus TCP/IP to RS485 gateway which allows to connects using RS485 an additional I/O modules or 3rd party Modbus devices. In order to ensure proper operation of Modbus Gateway please make sure that all parameters of RS485 (Baud Rate, Stop Bits ect.) of all the devices connected to RS485 (Gateway and an addition I/O modules/devices) are same.

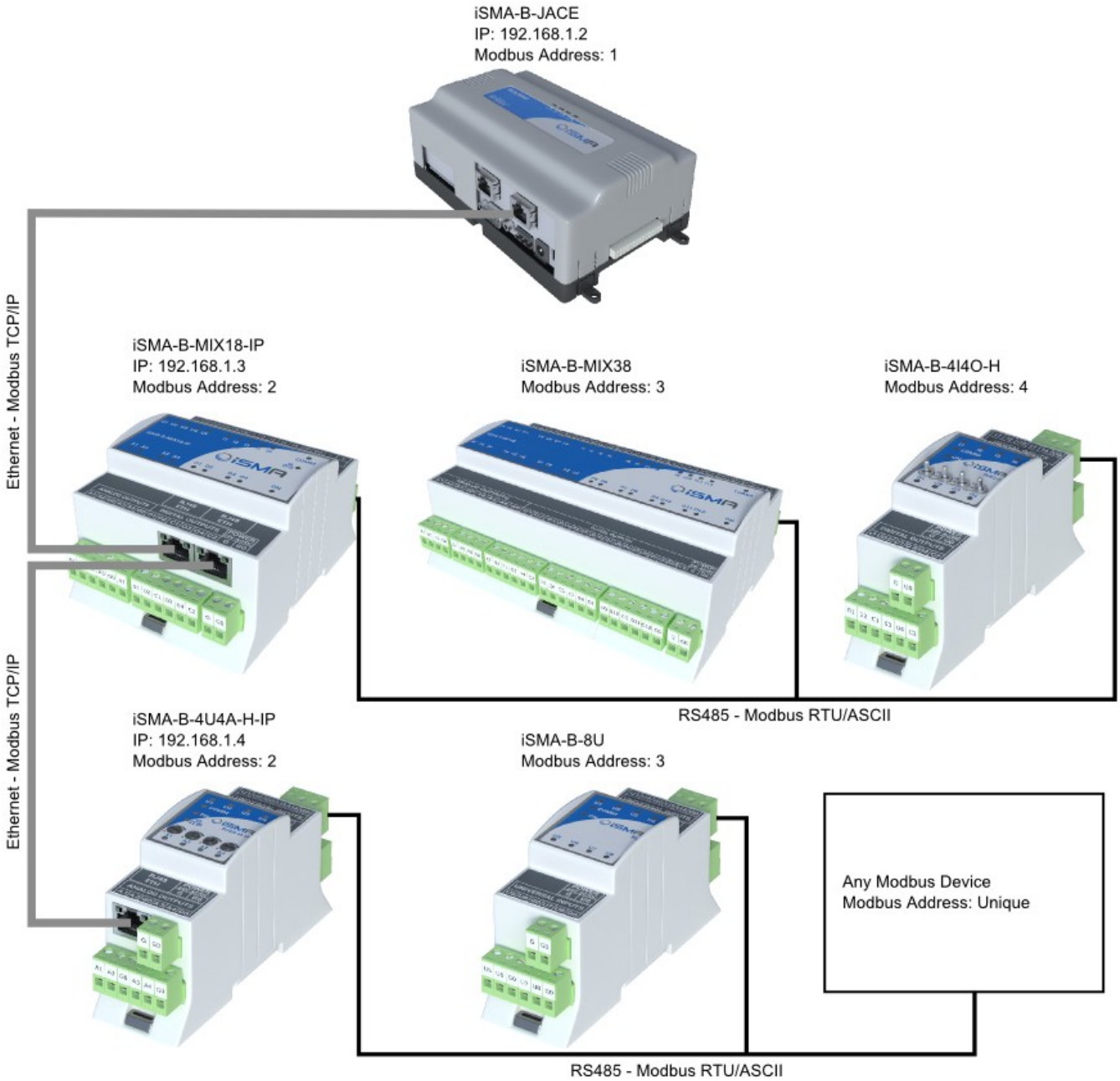


Figure 38 Modbus TCP/IP to RS485 Gateway an example

6 List of all Modbus Registers

Belowe is a table with all the registers available for all types of modules. Please notice that for some types of modules some of the registers are not available according to the physical number and types of Inputs and Outpus.

Modbus Address	Dec Address	Hex Address	Register name	Access	Description
30001	0	0x00	VERSION AND MODULE TYPE	Read Only	Firmware version and module type (30001)
30002	1	0x01	MODULE ADDRESS (state of switch)	Read Only	Module address (30002)
30003	2	0x02	BAUD RATE AND PROTOCOL (state of switch)	Read Only	Baud rate and protocol (30003))
30004	3	0x03	COUNTER OF RECEIVED FRAMES (32 – bits)	Read Only	Counter of received messages (30004) Default state is 0 Reset at the unit start and change of transmission parameters.
30006	5	0x05	COUNTER OF FRAMES WITH ERROR (32 – bits)	Read Only	Counter of error messages (30006) Default state is 0 Reset at the unit start and change of transmission parameters.
30008	7	0x07	COUNTER OF SENT FRAMES (32 – bits)	Read Only	Counter of sent messages (30008) Default state is 0 Reset at the unit start and change of transmission parameters.
30015	14	0xE	STATUS OF MANUAL OPERATION	Read Only	Status of manual operation DO and AO for modules MINI series
30016	15	0x0F	STATE OF DIGITAL INPUTS	Read Only	State of digital inputs (30016)
30017	16	0x10	STATE OF UNIVERSAL INPUTS WORKING AS DIGITAL INPUTS	Read Only	Status of universal inputs working as digital inputs (30017)
40001	0	0x00	DEVICE ACTIONS	Read & Write	Allows to enable 1 of 3 device actions
40018	17	0x11	STATE OF DIGITAL OUTPUTS	Read & Write	State of digital outputs (40018)
40019	18	0x12	STATE OF ANALOG OUTUTS WORKING AS DIGITAL OUTPUTS	Read & Write	State of analog outputs working as digital outputs (40019)
40020	19	0x12	DIGITAL INPUTS COMMAND REGISTER	Read & Write	Digital inputs command register (40020)
40022	21	0x15	COUNTER RESET	Read & Write	Resetting counters (40022) Set bit in register to reset corresponding counter.
40023	22	0x16	COUNTER 1 LSB	Read & Write Memory	Counter 1 – 8 (40023, 40024 – 40037, 40038) 32-bit counters for each digital input counting pulses.
40024	23	0x17	COUNTER 1 MSB		
40025	24	0x18	COUNTER 2 LSB	Read &	

Modbus Address	Dec Address	Hex Address	Register name	Access	Description
40026	25	0x19	COUNTER 2 MSB	Write Memory	
40027	26	0x1A	COUNTER 3 LSB	Read & Write Memory	
40028	27	0x1B	COUNTER 3 MSB		
40029	28	0x1C	COUNTER 4 LSB	Read & Write Memory	
40030	29	0x1D	COUNTER 4 MSB		
40031	30	0x1E	COUNTER 5 LSB	Read & Write Memory	
40032	31	0x1F	COUNTER 5 MSB		
40033	32	0x20	COUNTER 6 LSB	Read & Write Memory	
40034	33	0x21	COUNTER 6 MSB		
40035	34	0x22	COUNTER 7 LSB	Read & Write Memory	
40036	35	0x23	COUNTER 7 MSB		
40037	36	0x24	COUNTER 8 LSB	Read & Write Memory	
40038	37	0x25	COUNTER 8 MSB		
40039	38	0x26	COUNTER 9 LSB	Read & Write Memory	
40040	39	0x27	COUNTER 9 MSB		
40041	40	0x28	COUNTER 10 LSB	Read & Write Memory	
40042	41	0x29	COUNTER 10 MSB		
40043	42	0x2A	COUNTER 11 LSB	Read & Write Memory	
40044	43	0x2B	COUNTER 11 MSB		
40045	44	0x2C	COUNTER 12 LSB	Read & Write Memory	
40046	45	0x2D	COUNTER 12 MSB		
30071	70	0x46	UIVERSAL INPUT VOLTAGE 1	Read Only	Table 12 UI register working as DI for MIX38 and MIX38-IP Universal input measure voltage (30071, 30073, 30075, **30077, 30079, 30087, 30089, 30091)** and Universal input measure temperature (30072, 30074, 30076, 30078, 30080, 30095, 30097, 30099) Voltage measurement value is expressed in mV.
30072	71	0x47	UIVERSAL INPUT TEMPERATURE 1	Read Only	
30073	72	0x48	UIVERSAL INPUT VOLTAGE 2	Read Only	
30074	73	0x49	UIVERSAL INPUT TEMPERATURE 2	Read Only	
30075	74	0x4A	UIVERSAL INPUT VOLTAGE 3	Read Only	
30076	75	0x4B	UIVERSAL INPUT TEMPERATURE 3	Read Only	
30077	76	0x4C	UIVERSAL INPUT VOLTAGE 4	Read Only	

Modbus Address	Dec Address	Hex Address	Register name	Access	Description
30078	77	0x4D	UIVERSAL INPUT TEMPERATURE 4	Read Only	For current measurements, the formula for the current: $I = \frac{U}{500}$ where: U – register value, 500 – value of attached resistance Temperature is expressed in Celsius degrees * 10 For a result, divide the registry value by 10: $T = \frac{registervalue}{10}$ Selection of the type sensor is done using registers from 40151 to 40158 for each input separately
30079	78	0x4E	UIVERSAL INPUT VOLTAGE 5	Read Only	
30080	79	0x4F	UIVERSAL INPUT TEMPERATURE 5	Read Only	
30081	80	0x50	UIVERSAL INPUT VOLTAGE 6	Read Only	
30082	81	0x51	UIVERSAL INPUT TEMPERATURE 6	Read Only	
30083	82	0x52	UIVERSAL INPUT VOLTAGE 7	Read Only	
30084	83	0x53	UIVERSAL INPUT TEMPERATURE 7	Read Only	
30085	84	0x54	UIVERSAL INPUT VOLTAGE 8	Read Only	
30086	85	0x55	UIVERSAL INPUT TEMPERATURE 8	Read Only	
30087	86	0x56	UIVERSAL INPUT VOLTAGE 1	Read Only	
30088	87	0x57	UIVERSAL INPUT VOLTAGE 2	Read Only	
30089	88	0x58	UIVERSAL INPUT VOLTAGE 3	Read Only	
30090	89	0x59	UIVERSAL INPUT VOLTAGE 4	Read Only	
30091	90	0x5A	UIVERSAL INPUT VOLTAGE 5	Read Only	
30092	91	0x5B	UIVERSAL INPUT VOLTAGE 6	Read Only	
30093	92	0x5C	UIVERSAL INPUT VOLTAGE 7	Read Only	
30094	93	0x5D	UIVERSAL INPUT VOLTAGE 8	Read Only	
30095	94	0x5E	UIVERSAL INPUT TEMPERATURE 1	Read Only	
30096	95	0x5F	UIVERSAL INPUT TEMPERATURE 2	Read Only	
30097	96	0x60	UIVERSAL INPUT TEMPERATURE 3	Read Only	
30098	97	0x61	UIVERSAL INPUT TEMPERATURE 4	Read Only	
30099	98	0x62	UIVERSAL INPUT TEMPERATURE 5	Read Only	
30100	99	0x63	UIVERSAL INPUT TEMPERATURE 6	Read Only	
30101	100	0x64	UIVERSAL INPUT TEMPERATURE 7	Read Only	
30102	101	0x65	UIVERSAL INPUT TEMPERATURE 8	Read Only	
30103	102	0x66	RESISTIVE INPUT 1 LSB	Read Only	Universal input measure resistance 1 - 8 (30103, 30104 – 30117, 30118)
30104	103	0x67	RESISTIVE INPUT 1 MSB	Read Only	

Modbus Address	Dec Address	Hex Address	Register name	Access	Description
30105	104	0x68	RESISTIVE INPUT 2 LSB	Read Only	Resistance measurement result expressed in Ω
30106	105	0x69	RESISTIVE INPUT 2 MSB	Read Only	
30107	106	0x6A	RESISTIVE INPUT 3 LSB	Read Only	
30108	107	0x6B	RESISTIVE INPUT 3 MSB	Read Only	
30109	108	0x6C	RESISTIVE INPUT 4 LSB	Read Only	
30110	109	0x6D	RESISTIVE INPUT 4 MSB	Read Only	
30111	110	0x6E	RESISTIVE INPUT 5 LSB	Read Only	
30112	111	0x6F	RESISTIVE INPUT 5 MSB	Read Only	
30113	112	0x70	RESISTIVE INPUT 6 LSB	Read Only	
30114	113	0x71	RESISTIVE INPUT 6 MSB	Read Only	
30115	114	0x72	RESISTIVE INPUT 7 LSB	Read Only	
30116	115	0x73	RESISTIVE INPUT 7 MSB	Read Only	
30117	116	0x74	RESISTIVE INPUT 8 LSB	Read Only	
30118	117	0x75	RESISTIVE INPUT 8 MSB	Read Only	
40121	120	0x78	VALUE OF ANALOG OUTPUT 1	Read & Write	The voltage at the analog outputs given in the mV range from 0 to 10000mV
40122	121	0x79	VALUE OF ANALOG OUTPUT 2	Read & Write	
40123	122	0x7A	VALUE OF ANALOG OUTPUT 3	Read & Write	
40124	123	0x7B	VALUE OF ANALOG OUTPUT 4	Read & Write	
40125	124	0x7C	VALUE OF ANALOG OUTPUT 5	Read & Write	
40126	125	0x7D	VALUE OF ANALOG OUTPUT 6	Read & Write	
40136	135	0x87	BAUD RATE	Read & Write Memory	Baud rate (40136) Transmission speed is defined by the user calculated using the formula: $Baudrate = (registervalue) \cdot 10$ The value is considered only when sections 1, 2 and 3 of S3 switch is in the OFF position The default value is 7680 (76800 bps)
40137	136	0x88	STOP BITS	Read & Write Memory	Stop bits (40137) Supported values are 1 and 2 The default value 1
40138	137	0x89	DATA BITS	Read & Write Memory	Data bits (40138) Supported values are 7 and 8 The default value 7
40139	138	0x8A	PARITY BIT	Read & Write	Parity bit (40139) The default value is 0 (no parity)

<table>
<tr><th>Modbus Address</th><th>Dec Address</th><th>Hex Address</th><th>Register name</th><th>Access</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Memory</td><td>Allowed values:<table><tr><th>Value</th><th>Description</th></tr><tr><td>0 (default)</td><td>none</td></tr><tr><td>1</td><td>Odd</td></tr><tr><td>2</td><td>Even</td></tr><tr><td>3</td><td>Always 1</td></tr><tr><td>4</td><td>Always 0</td></tr></table></td></tr>
<tr><td>40140</td><td>139</td><td>0x8B</td><td>RESPONSE DELAY</td><td>Read & Write Memory</td><td>Table 11 Parity bit
Response delay time (40140)
Delay in ms before sending response
The default value is 0.</td></tr>
<tr><td>40141</td><td>140</td><td>0x8C</td><td>WATCHDOG TIME</td><td>Read & Write Memory</td><td>Watchdog time (40141)
Time in second before watchdog reset in case no transmission.
A value of 0 disables Watchodog.
The default value is 15s</td></tr>
<tr><td>40143</td><td>142</td><td>0x8E</td><td>DEFAULT STATE OF DIGITAL OUTPUTS</td><td>Read & Write Memory</td><td>Table 22 State of DO for MIX38 and MIX38-IP Default state of digital outputs (40143)
State of digital outputs assigned at the start of the module and watchdog reset.
The default value is 0.</td></tr>
<tr><td>40144</td><td>143</td><td>0x8F</td><td>DEFAULT STATE OF ANALOG OUTPUTS (DIGITAL)</td><td>Read & Write Memory</td><td>Default state of the analog outputs (digital) (40144)State of analog outputs assigned at the start of the module and watchdog reset.
The default value is 0.</td></tr>
<tr><td>40145</td><td>144</td><td>0x90</td><td>DEFAULT STATE OF ANALOG OUTPUT 1</td><td>Read & Write Memory</td><td rowspan="7">In the registers is stored value in mV of voltage that appears at the analog output after power on or watchdog reset.
The default value is 0.</td></tr>
<tr><td>40146</td><td>145</td><td>0x91</td><td>DEFAULT STATE OF ANALOG OUTPUT 2</td><td>Read & Write Memory</td></tr>
<tr><td>40147</td><td>146</td><td>0x92</td><td>DEFAULT STATE OF ANALOG OUTPUT 3</td><td>Read & Write Memory</td></tr>
<tr><td>40148</td><td>147</td><td>0x93</td><td>DEFAULT STATE OF ANALOG OUTPUT 4</td><td>Read & Write Memory</td></tr>
<tr><td>40149</td><td>148</td><td>0x94</td><td>DEFAULT STATE OF ANALOG OUTPUT 5</td><td>Read & Write Memory</td></tr>
<tr><td>40150</td><td>149</td><td>0x95</td><td>DEFAULT STATE OF ANALOG OUTPUT 6</td><td>Read & Write Memory</td></tr>
<tr><td>40151</td><td>150</td><td>0x96</td><td>UNIVERSAL INPUT</td><td>Read &</td><td>Universal input configuration 1 - 8 (40151 –</td></tr>
</table>

<table>
<tr><th>Modbus Address</th><th>Dec Address</th><th>Hex Address</th><th>Register name</th><th>Access</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td>CONFIGURATION 1</td><td>Write Memory</td><td rowspan="9">40158)

Configuration of universal input and type of temperature sensor.

The
<table><tr><th>Value</th><th>Description / Sensor</th></tr><tr><td>0</td><td>Resistance measurement off</td></tr><tr><td>1</td><td>10K3A1 NTC</td></tr><tr><td>2</td><td>10K4A1 NTC</td></tr><tr><td>3</td><td>10K NTC Carel</td></tr><tr><td>4</td><td>20K6A1 NTC</td></tr><tr><td>5</td><td>2,2K3A1 NTC B=3975K</td></tr><tr><td>6</td><td>3K3A1 NTC</td></tr><tr><td>7</td><td>30K6A1 NTC</td></tr><tr><td>8</td><td>SIE1</td></tr><tr><td>9</td><td>TAC1</td></tr><tr><td>10</td><td>SAT1</td></tr><tr><td>16</td><td>Pt1000</td></tr><tr><td>17</td><td>Ni1000</td></tr><tr><td>+128</td><td>Voltage measurement off</td></tr></table>
default value is 1.</td></tr>
<tr><td>40152</td><td>151</td><td>0x97</td><td>UNIVERSAL INPUT CONFIGURATION 2</td><td>Read & Write Memory</td></tr>
<tr><td>40153</td><td>152</td><td>0x98</td><td>UNIVERSAL INPUT CONFIGURATION 3</td><td>Read & Write Memory</td></tr>
<tr><td>40154</td><td>153</td><td>0x99</td><td>UNIVERSAL INPUT CONFIGURATION 4</td><td>Read & Write Memory</td></tr>
<tr><td>40155</td><td>154</td><td>0x9A</td><td>UNIVERSAL INPUT CONFIGURATION 5</td><td>Read & Write Memory</td></tr>
<tr><td>40156</td><td>155</td><td>0x9B</td><td>UNIVERSAL INPUT CONFIGURATION 6</td><td>Read & Write Memory</td></tr>
<tr><td>40157</td><td>156</td><td>0x9C</td><td>UNIVERSAL INPUT CONFIGURATION 7</td><td>Read & Write Memory</td></tr>
<tr><td>40158</td><td>157</td><td>0x9D</td><td>UNIVERSAL INPUT CONFIGURATION 8</td><td>Read & Write Memory</td></tr>
<tr><td>40159</td><td>158</td><td>0x9E</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 1</td><td>Read & Write Memory</td><td rowspan="6">Filter time constant of the universal input 1 - 8 (40159 – 40166)

Filter time constant, expressed in seconds in the range from 0 to 60 seconds.
A value of 0 disables the filter.
The default value is 2s.</td></tr>
<tr><td>40160</td><td>159</td><td>0x9F</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 2</td><td>Read & Write Memory</td></tr>
<tr><td>40161</td><td>160</td><td>0xA0</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 3</td><td>Read & Write Memory</td></tr>
<tr><td>40162</td><td>161</td><td>0xA1</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 4</td><td>Read & Write Memory</td></tr>
<tr><td>40163</td><td>162</td><td>0xA2</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 5</td><td>Read & Write Memory</td></tr>
<tr><td>40164</td><td>163</td><td>0xA3</td><td>FILTER TIME CONSTANT</td><td>Read &</td></tr>
</table>

<table>
<tr><th>Modbus Address</th><th>Dec Address</th><th>Hex Address</th><th>Register name</th><th>Access</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td>OF THE UNIVERSAL INPUT 6</td><td>Write Memory</td><td rowspan="3"></td></tr>
<tr><td>40165</td><td>164</td><td>0xA4</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 7</td><td>Read & Write Memory</td></tr>
<tr><td>40166</td><td>165</td><td>0xA5</td><td>FILTER TIME CONSTANT OF THE UNIVERSAL INPUT 8</td><td>Read & Write Memory</td></tr>
<tr><td>40167</td><td>166</td><td>0xA6</td><td>RESOLUTION OF THE UNIVERSAL INPUTS</td><td>Read & Write Memory</td><td>Resolution of the universal inputs (40167)
Resolution of analog inputs. When bit is set measurement at corresponding input is done with 16-bit resolution.
By default, all measurements are done with 12-bit resolution.</td></tr>
<tr><td>40168</td><td>167</td><td>0xA7</td><td>ANALOG OUTPUT CONFIGURATION 1</td><td>Read & Write Memory</td><td rowspan="7">Configuration mode of analog output 1 – 6 (40168 – 40173)

Configuring the mode of analog output according to the following table:

<table><tr><th>Value</th><th>Description</th></tr><tr><td>0 (default)</td><td>Voltage output 0-10V</td></tr><tr><td>1</td><td>PWM 1Hz</td></tr><tr><td>2</td><td>PWM 10Hz</td></tr><tr><td>3</td><td>PWM 100Hz</td></tr><tr><td>4</td><td>PWM 0.1Hz</td></tr><tr><td>5</td><td>PWM 0.01Hz</td></tr></table></td></tr>
<tr><td>40169</td><td>168</td><td>0xA8</td><td>ANALOG OUTPUT CONFIGURATION 2</td><td>Read & Write Memory</td></tr>
<tr><td>40170</td><td>169</td><td>0xA9</td><td>ANALOG OUTPUT CONFIGURATION 3</td><td>Read & Write Memory</td></tr>
<tr><td>40171</td><td>170</td><td>0xAA</td><td>ANALOG OUTPUT CONFIGURATION 4</td><td>Read & Write Memory</td></tr>
<tr><td>40172</td><td>171</td><td>0xAB</td><td>ANALOG OUTPUT CONFIGURATION 5</td><td>Read & Write Memory</td></tr>
<tr><td>40173</td><td>172</td><td>0xAC</td><td>ANALOG OUTPUT CONFIGURATION 6</td><td>Read & Write Memory</td></tr>
<tr><td>40176</td><td>175</td><td>0xAF</td><td>DIGITAL INPUT 1 CONFIGURATIO MODE</td><td>Read & Write Memory</td><td rowspan="6"><table><tr><th>Value</th><th>Description</th></tr><tr><td>0</td><td>Ordinary IO</td></tr><tr><td>1</td><td>Monostabile Relay</td></tr><tr><td>2</td><td>Bistabile Relay</td></tr><tr><td>3</td><td>Time Relay</td></tr></table>TIME VALUE [ms]</td></tr>
<tr><td>40177</td><td>176</td><td>0xB0</td><td>DIGITAL INPUT 1 TIME VALUE</td><td>Read & Write Memory</td></tr>
<tr><td>40180</td><td>179</td><td>0xB3</td><td>DIGITAL INPUT 2 CONFIGURATIO MODE</td><td>Read & Write Memory</td></tr>
<tr><td>40181</td><td>180</td><td>0xB4</td><td>DIGITAL INPUT 2 TIME VALUE</td><td>Read & Write Memory</td></tr>
<tr><td>40184</td><td>183</td><td>0xB7</td><td>DIGITAL INPUT 3</td><td>Read &</td></tr>
</table>

Modbus Address	Dec Address	Hex Address	Register name	Access	Description
			CONFIGURATIO MODE	Write Memory	
40185	184	0XB8	DIGITAL INPUT 3 TIME VALUE	Read & Write Memory	
40188	187	0xBB	DIGITAL INPUT 4 CONFIGURATIO MODE	Read & Write Memory	
40189	188	0xBC	DIGITAL INPUT 4 TIME VALUE	Read & Write Memory	

7 List of supported temperature sensors

No	1	No	2
Sensor	10K3A1	Sensor	10K4A1
β coeffictient	3975K	β coeffictient	3695K
Manufacturers	Aquatrol, Cylon, Honeywell, Johnson, Satchwell, Seachange	Manufacturers	Andover, Delta Controls, Siebe, York
°C	Ω	°C	Ω
−50	667828	−50	441667
-45	491749	-45	330749
−40	335671	−40	239831
-35	241840	-35	181532
−30	176683	−30	135233
-25	131251	-25	105081
−20	96974	−20	78930
−15	72895	−15	61030
−10	55298	−10	47549
−5	42314	−5	37316
0	32650	0	29490
5	25396	5	23462
10	19904	10	18787
15	15714	15	15136
20	12494	20	12268
25	10000	25	10000
30	8056	30	8197
35	6530	35	6754
40	5325	40	5594
45	4367	45	4656
50	3601	50	3893
55	2985	55	3271
60	2487	60	2760
65	2082	65	2339
70	1751	70	1990
75	1480	75	1700
80	1256	80	1458
85	1070	85	1255
90	916	90	1084
95	787	95	939
100	678	100	817
105	587	105	713
110	510	110	624
115	444	115	547
120	388	120	482
125	340	125	426

No	3	No	4
Sensor	10K Carel	Sensor	20K6A1
β coeffictient	3435K	β coeffictient	4262K
−50	329500	Manufacturers	Honeywell
-45	247700	°C	Ω
−40	188500	−40	806800
-35	144100	-35	574400
−30	111300	−30	413400
-25	86430	-25	300400
−20	67770	−20	220600
−15	53410	−15	163480
−10	42470	−10	122260
−5	33900	−5	92220
0	27280	0	70140
5	22050	5	53780
10	17960	10	41540
15	14690	15	32340
20	12090	20	25340
25	10000	25	20000
30	8313	30	15886
35	6940	35	12698
40	5827	40	10212
45	4912	45	8260
50	4161	50	6718
55	3536	55	5494
60	3020	60	4518
65	2588	65	3732
70	2228	70	3098
75	1924	75	2586
80	1668	80	2166
85	1451	85	1823
90	1266	90	1541
95	1108	95	1308
100	973	100	1114
105	857	105	953
110	758	110	818
115	672	115	704
120	597	120	609
125	531	125	528

No	5	No	6
Sensor	2.2K3A1	Sensor	3K3A1
β coeffictient	3975K	β coeffictient	3975K
Manufacturers	Ambiflex, Johnson	Manufacturers	Alerton
°C	Ω	°C	Ω
−50	329500	−50	200348
-45	247700	-45	150524
−40	188500	−40	100701
-35	144100	-35	76853
−30	111300	−30	53005
-25	86430	-25	41048
−20	67770	−20	29092
−15	53410	−15	21868
−10	42470	−10	16589
−5	33900	−5	12694
0	27280	0	9795
5	22050	5	7619
10	17960	10	5971
15	14690	15	4714
20	12090	20	3748
25	10000	25	3000
30	8313	30	2417
35	6940	35	1959
40	5827	40	1598
45	4912	45	1310
50	4161	50	1080
55	3536	55	896
60	3020	60	746
65	2588	65	625
70	2228	70	526
75	1924	75	444
80	1668	80	377
85	1451	85	321
90	1266	90	275
95	1108	95	236
100	973	100	204
105	857	105	176
110	758	110	153
115	672	115	133
120	597	120	117
125	531	125	102

No	7	No	8
Sensor	30K6A1	Sensor	SIE1
β coeffictient	4262K	Manufacturers	Barber Colman, Siebe
Manufacturers	Drayton	°C	Ω
°C	Ω	−50	10732
−30	622911	-45	10624
-25	477393	−40	10517
−20	331876	-35	10344
−15	245785	−30	10172
−10	183697	-25	9913
−5	138502	−20	9654
0	105305	−15	9320
5	60713	−10	8933
10	62347	−5	8496
15	48511	0	8044
20	38019	5	7489
25	30000	10	6938
30	23828	15	6370
35	19046	20	5798
40	15317	25	5238
45	12390	30	4696
50	10079	35	4185
55	8243	40	3707
60	6777	45	3271
65	5600	50	2875
70	4650	55	2521
75	3879	60	2206
80	3251	65	1929
85	2737	70	1685
90	2313	75	1472
95	1963	80	1287
100	1672	85	1127
105	1430	90	986
110	1228	95	866
115	1058	100	760
120	915	105	670
125	793	110	590
		115	522
		120	462
		125	410

No	9	No	10
Sensor	TAC1	Sensor	SAT1
β coeffictient	3500K	Manufacturers	Satchwell
Manufacturers	TAC	°C	Ω
°C	Ω	−50	9719
−40	39024	-45	9652
-35	29358	−40	9584
−30	22284	-35	9467
-25	17073	−30	9349
−20	13192	-25	9159
−15	10276	−20	8968
−10	8068	−15	8708
−5	6382	−10	8396
0	5085	−5	8031
5	4078	0	7614
10	3294	5	7150
15	2676	10	6649
20	2188	15	6121
25	1800	20	5580
30	1488	25	5039
35	1237	30	4513
40	1034	35	4012
45	869	40	3545
50	733	45	3117
55	622	50	2730
60	529	55	2386
65	453	60	2082
70	389	65	1816
75	335	70	1585
80	290	75	1385
85	252	80	1213
90	220	85	1064
95	192	90	937
100	169	95	828
105	149	100	734
110	131	105	654
115	116	110	585
120	103	115	525
125	92	120	474
		125	429

No	16	No	16
Sensor	Pt1000	Sensor	Pt1000
Manufacturers	Honeywell, Sauter, Serck, Siebe, Cylon	Manufacturers	Honeywell, Sauter, Serck, Siebe, Cylon
°C	Ω	°C	Ω
-50	803	310	2156
-40	843	320	2192
-30	882	330	2227
-20	922	340	2262
-10	961	350	2297
0	1000	360	2332
10	1039	370	2367
20	1078	380	2402
30	1117	390	2436
40	1155	400	2471
50	1194		
60	1232	No	17
70	1271	Sensor	Ni1000
80	1309	Manufacturers	Sauter
90	1347	°C	Ω
100	1385	-50	743
110	1423	-40	791
120	1461	-30	841
130	1498	-20	893
140	1536	-10	946
150	1573	0	1000
160	1611	10	1056
170	1648	20	1112
180	1685	30	1171
190	1722	40	1230
200	1759	50	1291
210	1795	60	1353
220	1832	70	1417
230	1868	80	1483
240	1905	90	1549
250	1941	100	1618
260	1977	110	1688
270	2013	120	1760
280	2049	130	1833
290	2085	140	1909
300	2121	150	1987